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Form 10

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## TO BE COMPLETED BY APPLICANT

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Complete Specification for the invention entitled: IMPROVEMENTS IN PLUGS AND VALVES

The following statement is a full description of this invention, including the best method of performing it known to me:—

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\*Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

This invention relates to improvements in plugs and valves and relates particularly to an improved construction of plug or valve which is adapted to be used in a liquid container, such as an oil sump or the like, to enable the 5 liquid therein to be readily drained.

The invention is particularly adapted for use in an engine sump of an automobile or other like engine, or in other machine casings or sumps such as gear box and differential casings and machine tool sumps. Heretofore, engine sumps and the like which contain a lubricating oil are generally provided with a drain plug which is removable to enable oil to be drained from the sump. Similar fittings are provided in gear box and machine casings to enable lubricant removal and filling operations to be carried out.

15 Sump drain plugs and filling plugs, and the like, generally consist of a simple threaded plug with a head portion which is adapted to seal, with the aid of a suitable sealing washer, against a sealing surface on the sump or machine casing to prevent leakage of oil therefrom.

20 Such drain plugs and filling plugs are generally inconvenient to remove and replace and are often a source of oil leakage. Further, such plugs may become difficult and even impossible to remove due to corrosion and age, and the effects of vibration. Such plugs can therefore be 25 easily damaged during attempts at removal and consequently the threaded hole in which the plug is located may also be damaged which thus necessitates complete boring and re-threading of the drain hole to receive a new drain plug.

The use of the sump drain plug of the known type results 30 in the oil drainage operation being a relatively dirty and

messy procedure. The plug must firstly be loosened with a spanner or wrench and then withdrawn from the drain hole while oil is flowing from the hole. The oil issuing from the drain hole must be directed into a suitable container or 5 disposal means and it is often impossible with the present drain plug to remove the plug from an engine sump and drain the oil without leakage or spillage of an amount of oil.

It is an object of the present invention to provide an improved construction of sump plug which obviates at the 10 least some of the above mentioned disadvantages.

It is a further object of the present invention to provide an improved construction of sump drain plug which is extremely simple to use to drain a fluid from a sump or the like.

15 A still further object of the present invention is to provide an improved sump drain plug which is economical to manufacture and which may be simply installed in place of existing drain plugs.

According to one aspect of the invention there is provided 20 a sump drain plug comprising a hollow substantially cylindrical body open at both ends and adapted to be secured in a sump, machine casing or the like, a valve seat in said hollow body, a valve member biased into engagement with the valve seat to seal the hollow body against the flow of 25 fluid from the sump or the like, and a seal cap adapted to sealingly engage on the outer end of the hollow body.

Preferably, the hollow body is threadedly engaged in the sump and may be secured thereto by means of a lock nut.

It is also preferred that the valve member is spring biased 30 into engagement with the valve seat to seal the hollow body

against the flow of fluid.

The present invention also includes a sump drain member for use in combination with the sump drain valve of the invention. The drain member is adapted to be engaged with the sump drain valve and means are provided for releasing the valve member from engagement with the seat to permit oil in the sump to drain past the valve member. The sump drain member may include a cap portion adapted to replace the seal cap engaged on the outer end of the hollow body, and means adapted to project into the hollow body to engage and lift the valve member from the valve seat.

In order that the invention may be more clearly understood two embodiments thereof will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a sectional side elevational view of a sump drain valve for use in an automobile engine sump according to the invention,

Figure 2 is a similar view to Figure 1 but showing the sump drain valve in combination with a sump drain member,

Figure 3 is a sectional side elevational view of a modified form of sump drain valve according to the invention,

Figure 4 is a sectional side elevational view of the modified form of valve illustrated in Figure 3 in combination with a modified form of sump drain member, and

Figure 5 is a side elevational view of the sump drain member which is shown in Figure 4.

Referring to Figures 1 and 2 of the drawings, the sump drain valve 11 illustrated comprises a hollow cylindrical body member 12 which is open at its inner end 13 and outer end 14. The body member 12 is formed with a reduced

diameter inner end portion 16 which forms a shoulder 17. The shoulder 17 constitutes a seat which seals against sealing washer 21 when the valve 11 is secured in a vehicle engine sump 18. The reduced diameter portion 16 of the body member 12 is formed with an external thread 20 for engagement in a threaded drain hole 15 of the vehicle engine sump 18. A lock nut 19 is threaded over an external thread on the larger diameter part of the body member 12 to secure the body member 12 in the vehicle engine sump 18.

At its outer end, the body member 12 is provided with an internal thread 29 which receives a threaded valve seat 22. A valve member 24 consisting of a steel ball is biased against the valve seat 22 by means of a biasing spring 26. The spring seats against the internal shoulder 25 formed by the reduced diameter portion 16 of the body member 12.

The outer end of the body member 12 is sealed by means of a seal cap 27 and a sealing washer 28 located in the cap. The seal cap 27 is screw-threaded to engage the corresponding threaded body 12.

In use, the valve member 24 seals against the valve seat 22 thereby preventing oil in the vehicle engine sump to drain from the drain opening. To enable the oil to be drained from the sump, the seal cap 27 is removed from the valve body member 12 and a drain member 30 is threaded to the body member 12. The drain member consists of a metal sleeve 31 having at one end thereof a radially outwardly extending flange 32. A threaded nut 33 engages over the sleeve 31 and a radially inwardly extending shoulder 34 on the nut 33 engages with the flange 32 to secure the sleeve in position against the outer end of the body member 12. A washer 36

disposed between the engaging surfaces of the body member, the outer end of the valve seat 22 and the sleeve flange 32 prevents leakage of fluid.

The sleeve 31 is provided with a lance 37 consisting of 5 a pin welded to the inner wall of the sleeve 31 adjacent the flanged end. The pin 37 extends radially inwardly to the axis of the sleeve and then substantially axially to extend out beyond the end of the sleeve 31.

As illustrated in Figure 2, the lance is adapted to 10 engage with the valve member 24 to lift the member away from the valve seat 22. Oil in the sump 18 can then drain from the sump past the valve member 24. A pipe or hose 38 engages over the sleeve 31 and may be connected to a container or the like to receive the waste oil. When the 15 sump has been completely drained, the container may be sealed to enable disposal of the waste oil without risk of leakage or spillage thereof.

With reference to Figures 3 to 5 of the drawings, there is illustrated a modified form of sump drain valve. The 20 modified form of valve comprises a body portion 41 formed with a threaded inner end 42 and a shouldered outer end 43. The shoulder 44 on the outer end 43 is adapted to engage against a sealing washer 46 disposed between the shoulder 44 and the wall 47 of a sump 48.

The body portion 41 is hollow and a substantially 25 conical valve seat 49 is formed at the inner end of the hollow body portion 41. A combination valve and valve spool 51 is positioned in the body portion 41 and is adapted to move axially therein. The valve portion comprises a 30 valve head 52 having a substantially conical seat which

matches the valve seat 49 on the body portion 41. Adjacent the valve head 52 is a circumferential groove 53 adapted to contain an O-ring 54.

A valve spool 56 which is integral with the valve portion 5 comprises a substantially cylindrical spool body 57 which is open at its outer end 58 and which contains radial openings or ports 59 at its inner end adjacent the circumferential groove 53.

The combination valve and valve spool 51 is spring biased by spring 61 which engages between the valve head 52 and a bridge member 62 secured to and extending from the inner end of the body portion 41.

To complete the sealing arrangement of the drain valve, a groove 63 is formed on the internal wall of the body portion 41 and a second O-ring seal 64 is positioned in that groove 63.

A pair of radially extending, diametrically opposed pins 66 extend from the wall of the body portion 41 adjacent the outer end thereof. A sealing cap 67, with bayonet slots 20 engages with the pins to close the outer end of the body portion 41. A seal 68 is located in a groove 69 in the outer end surface of the body portion 41.

In use, the body portion 41 of the drain valve is threaded into the wall 47 of a sump 48, substantially as shown in Figure 3. The combination valve and valve spool 51 is spring biased to the closed position illustrated in Figure 3. In this position, oil in the sump is prevented from escaping therefrom by the engagement of the valve head 52 on the valve seat 49, and additionally by the O-ring seal 54 and the seal 68.

To enable oil in the sump to be drained therefrom, a valve drain member 72, illustrated in Figure 5, is engaged on the outer end 43 of the body portion 41 in place of the cap 67. The drain member 72 includes a cylindrical hollow sleeve 73 secured to and extending through a cap-like member 74 which is provided with bayonet slots 75 for engagement with the pins 66. A drain hose or tube 77 is engaged on the sleeve 73 to enable oil to be conveyed to a container or the like.

10 As shown in Figure 4, with the drain member 72 secured in position on the outer end 43 of the body portion, the inner end of the sleeve 73 engages with the spool body 57 and moves the combination valve and valve spool 51 axially of the body portion 41 against the action of 15 spring 61.

The length of the sleeve 73 projecting into the body portion 41 is calculated to enable the ports 59 to be moved beyond the inner end 42 of the body portion 41 to thereby communicate with the interior of the sump 48.

20 Oil in the sump is then able to flow through the ports 59 into the interior of the valve spool 56 and out through the sleeve 73 and tube 77.

The position of the groove 63 and O-ring seal 64 ensures that oil does not leak past the outer surface of the 25 valve spool 56 and the sleeve 73.

Removal of the drain member 72 from the body portion 41 results in an automatic sealing of the body portion by movement of the combination valve and valve spool 51 to the closed position under the action of the spring 61.

The claims defining the invention are as follows:

1. A valve comprising a body member adapted to be secured in a liquid-containing receptacle, said body member having a passageway therethrough, valve means adapted to seal the passageway and including a valve member biased into engagement with a valve seat in the passageway, drain means adapted to engage with the body member to lift the valve member away from its' engagement with the seat, and a cap adapted to be secured to the body member to seal against the outer most end of the passageway.
2. A valve according to claim 1 wherein said body member is hollow and open at both ends, and said valve means comprises a ball valve spring biased against a valve seat in the body member.
3. A valve according to claim 1 or claim 2 wherein the body member is substantially cylindrical with a threaded, reduced diameter inner end portion which engages a correspondingly threaded hole in the receptacle the body member having a shoulder which sealingly engages with a sealing surface on the receptacle to prevent leakage of liquid in the receptacle passed the body member.
4. A valve according to any one of claims 1 to 3 wherein said cap threadedly engages with the body member and includes a sealing washer to seal the passageway.
5. A valve according to claim 1 wherein said passageway comprises a substantially cylindrical bore through said body member, and said valve means includes a valve head having a substantially conical valve seat adapted to sealingly engage a correspondingly conical seat formed on the inner end of the body member.

6. A valve according to claim 5 wherein the valve means further includes an integral valve spool axially movable in the bore the spool being hollow and open at one end and having ports adjacent the other end communicating with the hollow interior.

7. A valve according to claim 6 wherein the valve means further includes a circumferential groove on the valve head adjacent the spool portion and an O-ring is disposed in the groove and is adapted to sealingly engage the wall of the bore when the valve head is engaged with the valve seat.

8. A valve according to claim 5 wherein said bore has an annular groove in the wall thereof and an O-ring is disposed therein to sealingly engage the cylindrical outer surface of the valve spool.

9. A valve according to claim 5 wherein the valve head is biased into engagement with the valve seat by a spring which acts axially between the valve head and a bridge fixed to the inner end of the body member.

10. A valve according to any one of the preceding claims wherein the drain means includes a tubular member adapted to be engaged with the outer end of the body member, so that means engaging the valve lift the valve away from its seat.

11. A valve according to claim 10 wherein said means engaging the valve includes a tubular sleeve adapted to axially move the valve spool so that the ports communicate with the interior of the receptacle.

12. A valve substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 12th day of May, 1976

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